II. Remarks

Reconsideration and allowance of the subject application are respectfully requested.

Claims 1-9 and 11 are pending in the application. Claim 1 is independent.

Claim 4 has been amended to depend upon claim 2 rather than claim 3.

35 U.S.C. 102(e) Rejections

In paragraph 2 of the detailed action, the Examiner has rejected claims 1 to 6 and 11 under 35 U.S.C. 102(e) as being anticipated by Poustie et al., U.S. Patent No. 5,796,891, hereinafter Poustie. The Examiner argues Poustie teaches "means for multiplying the amplified combined signals to yield comb-like multi-channel WDM (comb-like dispersion profiled fiber) laser signals comprising a plurality of more than two channels separated from each other by a frequency equal to the difference between F_1 and F_2", and the Examiner refers to column 9, lines 32 to 52.

To begin, it is important to realize that Poustie does teach an arrangement capable of behaving as a multiple wavelength optical source. This is shown in Figure 5 where consecutive sections of waveguide have a change in lateral

offset between their central axis of the waveguides at their interfaces so as to control the response of the entire arrangement. The arrangement of Figure 5 is then used in the arrangement of Figure 10 in order to create a multiple-wavelength source. It can be seen that in this arrangement that there is a single laser source 103 which feeds a ring-like arrangement, sometimes referred to as a "ring laser". Figure 12 shows an example output of this arrangement, namely a comb-like frequency response. It can be seen that once the arrangement of Figure 10 is constructed, there is no way to control the spacing between the frequencies of the comb-like frequency response of Figure 12. Rather, the comb-like response is fixed once the circuit is designed.

In the anticipation argument, the Examiner has pointed in particular to Figure 14. Figure 14 shows a block diagram of a soliton pulse generator. The multi-λ source of Figure 14 is identified in column 9 as being any of the multi-wavelength sources described in Poustie for example the multi-wavelength source described previously with respect to Figures 5, 10 and 12 of Poustie. The examples show four or more wavelengths in this source (see Figure 12). The output of the multi-λ source is multiplied in the amplifier as

correctly identified by the Examiner. Then, the signal passes through a comb-like dispersion profile fiber. By "comb-like dispersion profile", what is meant is that the dispersion profile has a comb-like characteristic. In the illustrated example this consists of dispersion shifted fiber, standard telecommunications fiber, alternating back and forth between each other. Since the dispersion shifted fiber has a different dispersion profile than does the standard telecommunications fiber, by interconnecting a sequence of fibers in the manner of Figure 14 the dispersion profile of the overall fiber has a comb-like profile. It appears that the Examiner has equated the comb-like multi-channel WDM signal which involves a series of frequency peaks at each of a series of adjacent channels, with the comb-like dispersion profile which has nothing to do with the optical signal, but is instead a characteristic of the dispersion of a fiber. The Examiner has argued that the output of the arrangement of Figure 14 is a comb-like multi-channel WDM laser signal. However, column 9 of Poustie (see line 45) shows that the output of the arrangement of Figure 14 is in fact a series of compressed soliton pulses of short duration of about 2 ps. Thus, what is being shown in Figure 14 is

that by taking the output of a multi-λ source, amplifying it and then feeding it through a comb-like dispersion profile fiber, a soliton pulse source is realized.

Now lets turn to the specific language of claim 1. Claim 1 recites "a multi-wavelength laser source (MWLS) system, comprising:

(a) first and second monochromatic lasers having first (F_1) and second (F_2) lasing frequencies, respectively".

The Examiner argues that the "multi-wavelength source" of Figure 14 of Poustie provides these first and second lasers. As discussed above, this is not in fact correct. The multi-λ source of Figure 14 of Poustie is any of the multi-wavelength sources constructing according to any of the alternatives described in Poustie. Various alternatives are described in Poustie including the one discussed above with reference to Figure 10. None of these arrangements have two laser sources each generating respective lasing frequencies. Rather, the embodiment of Figure 10 of Poustie shows a single laser source which then goes through a ring arrangement to produce a comb-like frequency response such as that shown in Figure 12. Thus, the cited reference does not in fact disclose first and

second monochromatic lasers having first and second lasing frequencies respectively.

Claim 1 goes on to recite:

"(b) means for amplifying combined signals of said first and second lasers".

The Examiner argues that the amplifier of Figure 14 provides this function. Applicants concede that the function of the amplifier of Figure 14 does appear to be similar to that of Applicants' amplifier, namely amplifying the signal that is input to the amplifier to yield an amplified output signal. The nature of the signal being amplified by the amplifier of Figure 14 does differ however from the signal being amplified in Applicants' embodiments because the multi-λ source of Figure 14 is different from the output of first and second monochromatic lasers.

Applicants' claim 1 continues with:

"(c) means for multiplying using non-linear optical effects the amplified combined signals to expand the coverage of the wavelength channels so as to yield comb-like multi-channel WDM laser signals comprising a plurality of more than two channels separated from each other by a frequency equal to the difference between F_1 and F_2".

The reason multiple channels are generated each

separated by a frequency equal to the difference between F_1 and F_2 is that a combination of the two outputs of the two monochromatic lasers results in a signal having a component which varies sinusoidally at the difference frequency $|F_2 - F_1|$. This is called the "beat frequency". There is only a single beat frequency when two monochromatic laser signals are combined. Non-linear optics effects, for example Cross Phase Modulation, Self Phase Modulation and Four Wave Mixing (referred to on page 6 at the top of the page) are all capable of introducing non-linear effects into an optical fiber. The Four Wave Mixing effect for example is well understood. A signal containing two components which is subject to Four Wave Mixing will produce a signal containing four components. The first two components are the original components. The third component is higher than the two original components by an amount equal to the difference between the two components. Finally the fourth component is below the lowest of the first two components by an amount equal to the difference between the two components. Thus, one multiplication stage will take two frequencies and produce four equally spaced frequencies. If higher order non-linearities are present, then additional frequency components will be generated all of which are separated by the original frequency difference. This is how the means for multiplying recited in claim 1 produces a plurality of more

than two channels separated from each other by a frequency equal to the difference between F_1 and F_2.

The Examiner has referred to the comb-like dispersion profile fiber of Figure 14 as producing this effect. However, as discussed above in the introduction to Poustie, the comb-like dispersion profile fiber of Figure 14 does not in fact achieve this effect. Rather, it takes the multi-wavelength signal produced by the multi-wavelength source (the ring laser), and transforms it into compressed soliton pulses of short duration of about 2 ps. A soliton pulse is not a multi-channel WDM laser signal comprising a plurality of more than two channels separated from each other by frequency equal to the difference between F_1 and F_2. Rather, a soliton pulse is a particular optical pulse having a shape, spectral content and power level designed to essentially negate dispersion over long distances. A train of soliton pulses is not equivalent to a multi-wavelength source. In fact, as seen in Figure 14, a multi-wavelength source is already provided, and further processing is used to convert the signal generated by the multi-wavelength source into a soliton pulse train.

In summary, the features of Applicants' claim 1 which are neither disclosed or suggested in the cited reference (taken individually or in combination) include the first and second monochromatic lasers, and the means for

multiplying the amplified combined signals to produce the previously discussed multi-wavelength signal. For these reasons, Applicants respectfully submit that claim 1 is not anticipated by the cited reference.

Furthermore, claim 6 recites a system in which there are five sections of fiber. The third fiber section is a single mode fiber (see claim 5) and the first, second, fourth and fifth fiber sections are dispersion shifted fiber sections. The comb-like dispersion profile fiber of Poustie as shown in Figure 14 does not feature segments having these characteristics. Rather, the fiber consists of many alternating segments of two fiber types with high anomalous dispersion and minimum absolute dispersion at the operational wavelength. In contrast, Applicants' claim 6 recites two segments of dispersion shifted fiber, a segment of single mode fiber and two more sections of dispersion shifted fiber. Recall from claim 2 that all neighbouring sections have different predetermined propagation characteristics. As such, the first and second fiber sections cannot be lumped together and considered as a single section of dispersion shifted fiber. In particular, the cited reference does not show the use of two segments of dispersion shifted fiber having different propagation of characteristics which are adjacent to each other in forming a wavelength multiplier.

For this reason, claim 6, in addition to the

previously discussed reasons respecting claim 1, should be patentable over the cited reference.

Finally, claim 11 which the Examiner has lumped in with claims 1 to 6 in the anticipation rejection, has not been addressed specifically by the Examiner. Claim 11 does introduce a new feature not found in the cited reference. The Examiner is respectfully requested to withdraw the rejection under 35 U.S.C. 102(e).

35 U.S.C. 103(a) Rejections

The Examiner goes on to reject claim 7 to 9 under 35 U.S.C. 103(a) as being unpatentable over Poustie. These claims should be patentable for the reasons discussed above pertaining to claim 1. Furthermore, as discussed above respecting claim 6, with this particular embodiment there are five sections and these involve two sections of dispersion shifted fiber, a section of single mode fiber and then two more sections of dispersion shifted fiber. This particular arrangement of fiber is, not withstanding the particular lengths or dispersion values, not something contemplated by the comb-like dispersion profile fiber of Poustie. Claim 7 recites particular lengths for the different segments; claim 8 recites particular dispersion values for each of the sections; and claim 9 recites particular wavelengths. The Examiner is respectfully requested to withdraw the rejection

under 35 U.S.C. 103(a).

It is noted that the term "comb-like dispersion profile fiber system" is used in Applicants' disclosure to refer to a fiber having a dispersion profile such as shown in Figure 2 for example. This term perhaps should not have been used. It is readily apparent that the dispersion profile shown in Figure 2 is not in fact comb-like as contemplated by the CDPF of Poustie. A comb-like response requires an alternation between two different values sequentially. In contrast, the arrangement of Figure 2 shows no such alternation between sequential values, rather adjacent values are different from each other.

In view of the above amendments and remarks, it is believed that this application is now in condition for allowance, and a Notice thereof is respectfully requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 625-3500.

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